ECOLOGY OF THE NESTING BIRDS OF THE McCURTAIN GAME PRESERVE, OKLAHOMA[1]

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THIS paper reports an ecological investigation of the nesting birds of a virgin woodland area. Field studies during the summer of 1961 and 1962 were conducted in the McCurtain Game Preserve near Bethel, in southeastern Oklahoma. The purpose of this paper is to describe the breeding bird populations of the major communities and to point to certain ecological relationships between these populations and their communities. Attention is directed to: (1) estimates of the breeding bird populations, (2) the type of habitats which these populations occupy for breeding and foraging territories, (3) and the community structure at the western fringe of the oak-pine forest.

This region is of particular interest since it represents a virgin forested area and is near the western limits of this formation. It is to be regretted that more detailed work has not been done in other biological fields within the river-bottom forests of the Preserve, as this association will soon be inundated by waters of the Broken Bow Reservoir. Construction of big dams, lumbering practices, and over-utilization by cattle and hogs in the river bottom areas of eastern Oklahoma are rapidly reducing the area of this biotic association and leaving the remainder unsuitable for many types of wildlife.

THE MCCURTAIN GAME PRESERVE

History of the Preserve.—The McCurtain Game Preserve includes 15,220 acres of mountainous land in north-central McCurtain County, Oklahoma. It is the only Oklahoma state-owned area of virgin oak-pine forest. According to P. R. Wheeler, director of the Southern Forest Experiment Station, New Orleans, Louisiana (in litt.) there is ". . . no comparable area of virgin timber in the Southeastern (Forest Service) Region." This, then, is a unique area for scientific research and one of high aesthetic value.

The Preserve was placed under the administration of the Oklahoma Game and Fish Department (now the Department of Wildlife Conservation) in 1927. Except for the boundary fence and maintenance roads, no cultural or management techniques were undertaken on the Preserve until 1950. During that year, a block of 40 acres was fenced in the central area of the Preserve to provide a holding pen for a turky restocking program. The Preserve has been protected from all forms of hunting and from fire, except for small burns, since 1926. Cattle penetrate the area from the surrounding open range when flooding or vandalism damages the fences, however, their numbers are small and they are promptly removed. No attempt is made to remove swine unless they become too numerous.

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Predator control, which has been maintained in the Preserve on a limited basis, has been limited to trapping of bobcats, gray foxes, coyotes, and wolves (?). Dogs that may stray into the Preserve are caught and returned to their owners.

The U.S. Army Corps of Engineers began survey work in the virgin river-bottom areas of the Preserve for the Broken Bow Reservoir during the summer of 1963. The opening of the Broken Bow Reservoir for public recreation will have a marked effect on the remote Preserve. Inundation will destroy the most unique areas of the Preserve, the virgin river-bottom hardwood forest. Enforcement of trespassing and hunting regulations and wilderness protection for the remainder of the Preserve will be made difficult as improvement of roads leading to the lake area increase the number of visitors.

Description of the Preserve.—The Preserve lies in the southern portion of the Ouachita Uplift. The terrain varies from moderately rugged or rather steeply rolling, to precipitous. Characteristically it is composed of rough ridges. Elevations vary from 561 feet above sea level along the Mountain Fork of the Little River to 1,363 feet on Pine Mountain in the east central part of the Preserve. Drainage of the Preserve is part of the Mountain Fork River system.

The soil materials in the valleys consist of shales and fill material; the ridges are composed of sandstones, shales, and slate. Streams of high gradient are actively cutting the narrow flood plains. Bottomland soils are leached, poorly drained, and relatively infertile. There are small prairie openings and areas that support savannah on soils with a higher clay content. Much of the mountain area is rough, stony land, with some of the formations dipping 60 degrees or more from the horizontal. The exposed edges of the rocks enable tree roots to grow between the layers. This, together with the high precipitation, results in superior forest sites. By contrast, in areas where shallow soils are on horizontally bedded rocks, very poor forest sites result. Ridges of the White Oak and Little White Oak mountains fall into this classification. Shale bands across the mountain slopes produce open or savannah areas with increased grass ground-cover.

The Ouachita Mountains of Oklahoma were first studied geologically by Honess (1923) with more recent detailed work in Beavers Bend State Park (Pitt and Spradling, 1963) a few miles south of the Preserve. Surface or near surface rocks which influence the soil and vegetative associations within the Preserve include formations from the Ordovician period to the Recent geologic epoch. These include: (1) Alluvium Formation of the Recent characterized by recent stream deposits of sand, silt and clay; (2) Trinity Formation of the Cretaceous; (3) Stanley Shale Formation of the Mississipian; (4) Arkansas Novaculite Formation, of which the Upper Division is of the Mississippian period, the Middle Division between the Mississippian and Devonian periods, the Lower Division of the Devonian; (5) Missouri Mountain Shale Formation of the Silurian; (6) Blaylock Sandstone Formation of the Silurian; (7) Polk Creek Shale Formation of the Ordovician; and (8) Bigfork Chert Formation of the Ordovician. The Stanley Shale Formation is the most extensive formation in the Preserve.

The Preserve is located in the area of Oklahoma which receives the highest annual rainfall. Approximately 75 per cent of the rainfall occurs during the growing season. Records for a 10-year (1954–1963) average monthly rainfall are shown in Table 1. Extremes for the 10-year period show a high of 12.42 inches in October 1954 and a low of 0.31 inches in October 1963. Rivers and streams in the area may rise rapidly in response to heavy rainfall during short periods of time, but the run-off is rapid. The 10-year temperature records showed the highest monthly average maximum of 93 F in July and the lowest monthly average minimum of 28 F in January, as shown in Table 1. A 24-year record showed an average annual frost-free period of about 233 days with

TABLE 1
TEN-YEAR AVERAGE (1954–1963) OF CLIMATOLOGICAL DATA

	Precipitation totals	Average Monthly Temperature (°F)	
		Maximum	Minimum
January	2.80	51.48	27.78
February	2.99	57.31	33.19
March	3.96	63.55	38.03
April	4.36	74.02	49.26
May	5.35	81.60	57.75
June	3.08	87.46	64.06
July	4.88	92.66	68.59
August	4.33	92.45	67.17
September	4.29	86.28	60.78
October	4.38	76.13	51.07
November	3.48	63.43	38.10
December	3.36	54.66	32.56

the last killing frost usually occurring the third week in March, and the first killing frost in the fall occurring about the second week in November. Published records of the U.S. Department of Commerce (1954–63) were consulted for all climatic data.

The Austroriparian Biotic Province (Dice, 1943), characterized by subclimax pine forests within the eastern deciduous forests, is found within this major climatic area. The Preserve is located in the western limits of this Province. The vegetative units within the Preserve may be delimited according to the topographic and soil characteristics of the site. Lindzey, studying the deer in the Preserve (1950), recognized six game (habitat) types within the Preserve. The steep north slopes and the protected ravines are characterized by white oak (*Quercus alba*), red oak (*Quercus rubra*), and flowering dogwood (*Cornus florida*). The ridges are characterized by mature stands principally of short-leaf pine (*Pinus echinata*), but include post oak (*Quercus stellata*), white oak (*Quercus alba*), and blackjack oak (*Quercus marilandica*). The south slopes have essentially the same composition as the ridges. A large portion of the Preserve manifests an intermediate condition, with variable sites which show a composite of other upland areas. The virgin river bottom hardwood forests are dominated by holly (*Ilex opaca*), white oak (*Quercus alba*), sweetgum (*Liquidambar styraciflua*), hickory (*Carya* sp.), ash (*Fraxinus* sp.), and baldcypress (*Taxodium distichum*), with cane (*Arundinaria gigantea*), spicebush (*Lindera benzoin*), and some panic grasses (*Panicum* spp.), for ground cover. The stream bottom woodlands typically have a composition similar to that of the north slopes. It is of major importantce to recall that the avian habitats are essentially of the same life-form in all areas of the Ouachita Uplift. Outside of the Preserve, however, mature virgin stands are found in very limited areas.

METHODS

The present study is an attempt to obtain the absolute abundance or the actual avian breeding populations of sample areas and to project these figures for an estimate of the total breeding bird populations for the Preserve. As

Table 2
Dominants and Codominants of the River Bottom Forest*

Species	Frequency of occurrence (per cent)	Basal area (sq. ft.)	Basal area (per cent)
American holly (*Ilex opaca*)	34	12.4	19.7
White oak (*Quercus alba*)	19	11.7	18.5
Sweetgum (*Liquidambar styraciflua*)	9	13.2	20.9
Mockernut Hickory (*Carya tomentosa*)	8	3.7	5.9
Sourgum (*Nyssa sylvatica*)	5	6.1	9.6
Ash (*Fraxinus* sp.)	5	0.9	1.4
Baldcypress (*Taxodium distichum*)	4	6.8	10.8
Hornbeam (*Ostrya virginiana*)	3	–	–
Ironwood (*Carpinus caroliniana*)	3	0.6	0.9
Total		63.1	

* Plant nomenclature taken from Petrides, 1958.

this study was primarily concerned with obtaining the most dependable results possible, a combination of various census techniques was employed.

On the basis of field reconnaissance and a review of aerial photos and topographic maps, three areas were selected for intensive study. This selection was based on the following points: areas were (1) representative of the three major plant communities in the Preserve; (2) not disturbed by roads, fence lines, or other maintenance improvements of the Preserve; (3) of uniform life-form and were surrounded by identical community type in order to eliminate edge effect; and (4) of adequate size for uniform plots. The boundaries of these areas were marked. The size of each plot was determined by use of steel tape, compass, and aerial photographs. A sketch map of each plot was used each time an area was censused. These maps included any distinctive landmark which helped pinpoint the exact locality. Field data were noted on the maps to show approximate locations of singing males, active nest sites, young out of the nest, adults carrying food, family groups, or any other behavioral activities or signs that would indicate nesting. The areas were censused from 5 AM to about 8 AM. I found that the activity of singing males for most species had decreased by 7:30 AM to 8:30 AM to the point that counts were invalid. However, observations on other activities associated with breeding could be made after that time.

The belt transect sampling method (Weaver and Clements, 1929; Lutz, 1930) was used to determine species composition of trees and shrubs in the sample plots. The width of the transect lines was 20 meters for trees and two meters for shrubs. In the upland samples with a large area of uniform community type, the length of the transect line was increased until the percentage composition was not varied when the last segment was added. The river

TABLE 3
UNDERSTORY PLANTS OF THE RIVER BOTTOM FOREST*

Species	Frequency of occurrence (per cent)
Ironwood (*Carpinus caroliniana*)	16
Ward willow (*Salix caroliniana*)	14
Mockernut hickory (*Carya tomentosa*)	9
Hornbeam (*Ostrya virginiana*)	9
Buttonbush (*Cephalanthus occidentalis*)	6
Grape (*Vitis* sp.)	5
Flowering dogwood (*Cornus florida*)	3
Sweetgum (*Liquidambar styraciflua*)	2
Red oak (*Quercus rubra*)	2
Baldcypress (*Taxodium distichum*)	2

* d.b.h. less than 4″; 1 m high.

bottom and stream bottom plots were sampled by three transect lines running at right angles to the plots.

BIRD POPULATIONS AND THE PLANT COMMUNITIES

The avian habitats of the Preserve reflect the basic structure of the dominant vegetation, rather than the species composition of individual plant associations—a point well demonstrated by Pitelka (1941) for the North American bird fauna. Considering the distribution of local bird species, the predominant habitats, preferred for breeding activities, are upland forests, river bottom forests, and stream bottom woodland.

The river bottom community.—The study area of this habitat type included that portion of the river bottom east of the Mountain Fork River from the low-water bridge north to the Preserve fence. The 35-acre study area was located in Section 4, R25E, T3S. Elevation was 560 feet above sea level. One-half mile of edge occurs along the river. The closure of the forest crown cover of this community varies from 50 to 100 per cent. The frequency of occurrence and basal area of the dominant and codominant trees is given in Table 2. The frequency of occurrence of the common understory plants is given in Table 3. The ground cover is sparse, composed chiefly of: *Panicum* sp., *Smilax* spp., spicebush (*Lindera benzoin*), and cane (*Arundinaria gigantea*). A high percentage of the river bottom forest floor is open, bare ground, or covered with river drift materials.

The river bottom community is the most important one of the Preserve for the study of bird ecology as it supports the greatest total biomass. The floral and faunal composition make this a unique feature of the Preserve.

TABLE 4
NESTING BIRDS OF THE RIVER BOTTOM FORESTS

Species	Pairs/100 acres 1961	Pairs/100 acres 1962	Average	Projected estimate (200 acres)
Turkey Vulture	+	+		+
Wood Duck		1	1	1.0
Red-shouldered Hawk	1	1	1	2.0
Bobwhite	+			+
Turkey	+	+		+
Yellow-billed Cuckoo	5.7	5.7	5.7	11.4
Barred Owl	8.6	2.9	5.7	11.4
Chuck-will's-widow	8.6	2.9	5.7	11.4
Chimney Swift	+	+		+
Ruby-throated Hummingbird	2.9		2.9	5.8
Belted Kingfisher	+	+		+
Pileated Woodpecker	2.9	2.9	2.9	5.8
Red-bellied Woodpecker	5.7	5.7	5.7	11.4
Hairy Woodpecker	5.7	2.9	4.3	8.6
Downy Woodpecker	2.9	2.9	2.9	5.8
Great Crested Flycatcher	8.6	2.9	5.8	11.6
Acadian Flycatcher	14.3	11.4	12.9	25.8
Eastern Wood Pewee	5.7	5.7	5.7	11.4
Blue Jay	+	+		+
Common Crow	1	1	1	2.0
Carolina Chickadee	11.4	11.4	11.4	22.8
Tufted Titmouse	5.7	8.6	7.2	14.4
White-breasted Nuthatch	8.6	2.9	5.7	11.4
Carolina Wren	8.6	8.6	8.6	17.2
Wood Thrush	2.9	2.9	2.9	5.8
Blue-gray Gnatcatcher	11.4	2.9	7.2	14.4
White-eyed Vireo	25.7	17.1	21.4	42.8
Red-eyed Vireo	28.5	25.7	27.1	54.2
Black-and-white Warbler	8.6	8.6	8.6	17.2
Prothonotary Warbler	1	1	1	2.0
Swainson's Warbler	1	1	1	2.0
Worm-eating Warbler	3	2	2.5	5.0
Parula Warbler	8.6	11.4	10.0	20.0
Cerulean Warbler	2.9	2.9	2.9	5.8
Ovenbird	5.7	2.9	4.3	8.6
Louisiana Waterthrush	8.6	8.6	8.6	17.2
Kentucky Warbler	11.4	8.6	10.0	20.0
Yellow-breasted Chat	2	2	2	4.0
Hooded Warbler	14.3	17.1	15.7	31.4
American Redstart	20.0	14.3	17.2	34.4
Cardinal	8.6	5.7	7.2	14.4
Indigo Bunting	2.9	2.9	2.9	4.8
Totals (36 species, +6)	279	219	248	502

TABLE 5
DOMINANTS AND CODOMINANTS OF THE STREAM BOTTOM FOREST

Species	Frequency of occurrence (per cent)	Basal area (sq. ft.)	Basal area (per cent)
White oak (*Quercus alba*)	17	11.0	14.1
Shortleaf pine (*Pinus echinata*)	17	23.1	29.6
Mockernut hickory (*Carya tomentosa*)	16	11.4	14.6
Sweetgum (*Liquidambar styraciflua*)	14	13.0	16.7
Ironwood (*Carpinus caroliniana*)	7	2.7	3.4
Sourgum (*Nyssa sylvatica*)	6	4.9	6.3
Red oak (*Quercus rubra*)	4	2.8	3.6
Red maple (*Acer rubrum*)	4	1.2	1.6
Hornbeam (*Ostrya virginiana*)	4	0.7	0.9
Swamp oak (*Quercus bicolor*)	2	0.7	0.9
Pignut hickory (*Carya glabra*)	2	1.0	1.3
Winged elm (*Ulmus alata*)	2	1.5	1.9
Sycamore (*Platanus occidentalis*)	2	2.9	3.7
Red mulberry (*Morus rubra*)	2	1.0	1.3
Ash (*Fraxinus* sp.)	2	0.6	0.7
Red cedar (*Juniperus virginiana*)	1	0.5	0.6
Total		78.0	

Studies in various areas of this community other than the study area show remarkable uniformity in proportions of species. There is very little disparity between the counts made during the two summers. The estimates of species in the study area and the projected estimates for the 200 acres of this community are given in Table 4. A plus sign (+) is used to indicate species which nested outside the study area in this habitat and species frequently observed but not definitely known to breed in the habitat. The figures for the average number of pairs are derived from the populations in the study areas and augmented by data from observations in the same habitat but outside the study area.

The stream bottom community.—The stream bottom community study area consisted of a 32-acre plot along Panther Branch in Sections 4 and 5. R25E, T3S. The area averaged 130 yards wide with the stream bed in the center and the outer boundaries more or less paralleling the stream bed. Sufficient width was allowed between these outer boundaries and the slopes to avoid edge effect.

The closure of the forest cover ranged from 50 to 75 per cent and was generally uniform. The frequency of occurrence and basal area of the dominant and codominant trees is given in Table 5. The frequency of occurrence of the common understory plants is given in Table 6. This community

Table 6
Understory Plants of the Stream Bottom Forest*

Species	Frequency of occurrence (per cent)
Ironwood (*Carpinus caroliniana*)	31
Red cedar (*Juniperus virginiana*)	16
Sweetgum (*Liquidambar styraciflua*)	11
Witch-hazel (*Hamamelis virginiana*)	10
Flowering dogwood (*Cornus florida*)	9
Hornbeam (*Ostrya virginiana*)	7
Red oak (*Quercus rubra*)	3
White oak (*Quercus alba*)	3
Shortleaf pine (*Pinus echinata*)	2
Sourgum (*Nyssa sylvatica*)	1
Mockernut hickory (*Carya tomentosa*)	1
Common spicebush (*Lindera benzoin*)	1
Winged elm (*Ulmus alata*)	1

* d.b.h. less than 4"; 1 m high.

had the best ground cover of the three major habitats of the Preserve. *Andropogon* spp. formed about 75 per cent of the non-woody ground cover. *Panicum* spp. and seedlings of the various woody species formed most of the remaining living ground cover. Heavy litter covered most of the space between plants so that very little bare ground was exposed.

The nesting bird populations showed a species composition intermediate between those of the moist river bottom and the drier uplands. No birds were restricted to this habitat. The estimate of species in the study area and the projected estimate for the 1,100 acres of this community in the Preserve are given in Table 7.

The upland community.—The upland Oak-Pine community study area was located in Sections 2 and 11, R25E, T3S. The 30-acre area was along the section line on the east side of the given sections. Crown closure of this area was from 70 to 100 per cent. The area is typical of the intermediate areas of the Preserve, that is, those with moderate slopes. Lindzey (1950) recognized four game types in the upland community. However, field observations showed no significant variations in the avian species distribution in these four types. Significant divergence of species composition did occur on White Oak and Little White Oak mountains, but the remoteness of these areas made it impossible to adequately sample the bird populations there. The frequency of occurrence and basal area of the dominant and codominant trees are given in Table 8. The frequency of occurrence of the common understory plants is given in Table 9. The ground cover varied

TABLE 7
NESTING BIRDS OF THE STREAM BOTTOM FORESTS

Species	Pairs/100 acres 1961	Pairs/100 acres 1962	Average	Projected estimate (1,100 acres)
Turkey Vulture	+	+		+
Broad-winged Hawk	3.1	+	1	11
Sparrow Hawk	+	3.1	1	11
Bobwhite	3.1	+	3.1	34
Yellow-billed Cuckoo	3.1	3.1	3.1	34
Screech Owl	3.1	+	1	11
Chuck-will's-widow	+	+		+
Chimney Swift	+	+		+
Ruby-throated Hummingbird	1		1	11
Pileated Woodpecker	1	1	1	11
Red-bellied Woodpecker		+		+
Hairy Woodpecker	3.1	3.1	3.1	34
Downy Woodpecker	3.1	3.1	3.1	34
Great Crested Flycatcher	3.1	3.1	3.1	34
Acadian Flycatcher	9.4	6.3	7.9	87
Eastern Wood Pewee	9.4	9.4	9.4	103
Blue Jay	6.3	3.1	4.7	52
Common Crow	+	+		+
Carolina Chickadee	12.5	9.4	10.5	116
Tufted Titmouse	3.1	6.3	4.7	52
White-breasted Nuthatch	6.3	6.3	6.3	69
Carolina Wren	9.4	9.4	9.4	103
Wood Thrush		+		+
Blue-gray Gnatcatcher	6.3	3.1	4.7	52
White-eyed Vireo	3.1	3.1	3.1	34
Red-eyed Vireo	18.8	18.8	18.8	207
Black-and-white Warbler	3.1	3.1	3.1	34
Parula Warbler	9.4	12.5	10.5	116
Pine Warbler	9.4	6.3	7.9	87
Ovenbird	3.1	3.1	3.1	34
Louisiana Waterthrush	3.1	6.3	4.7	52
Kentucky Warbler	3.1	+	3.1	34
Indigo Bunting	+	3.1	3.1	34
Totals (27 species, +6)	140	126	136	1,491

from sparse *Andropogon* in the more open areas to exclusively pine needle and leaf litter in areas with dense crown cover.

The virgin stands of mature short-leaf pine are the habitat of the Preserve's two most unique permanent avian residents, the Red-cockaded Woodpecker and the Brown-headed Nuthatch. Nice (1931) reported Red-cockaded Woodpeckers in 1925. This species was not recorded from the state again until

Table 8
Dominants and Codominants of the Upland Forests

Species	Frequency of occurrence (per cent)	Basal area (sq. ft.)	Basal area (per cent)
Shortleaf pine (*Pinus echinata*)	81	69.6	87.0
White oak (*Quercus alba*)	10	2.9	3.6
Post oak (*Quercus stellata*)	7	6.6	8.4
Blackjack oak (*Quercus marilandica*)	2	0.2	0.25
Total		79.3	

1954 (Baumgartner, 1954). The Red-cockaded Woodpeckers were limited in distribution in the Preserve to areas with stands of large mature pine—d.b.h. 15 inches or more. Nest trees which I was able to locate averaged 17 inches d.b.h. Their habit of scaling the bark from the living pine for two feet above and below the entrance of the nest cavity and of puncturing a series of small holes to allow the pine pitch to ooze to the surface allows the nests to be located easily. The only nesting record for Oklahoma outside of the Preserve was reported in Robber's Cave State Park near Wilburton in 1961 (Baumgartner, 1961). The Brown-headed Nuthatch was observed in Pushmataha County in 1920 (Nice, 1921) and was not recorded in Oklahoma again until 1953 (Baumgartner, 1954). Tom Jessee, then the Preserve manager, reported this species nesting in a fence post on the Preserve on 11 March 1954 with young noted in late April. Other species found in the upland habitat are considered typical for the region. The estimates of species in the study area and the projected estimate for the 12,000 acres of this community type are given in Table 10.

DISCUSSION

Eleven species were nesting only in the river bottom habitat within the Preserve. No species were found using the stream bottom habitat exclusively for nesting. However, seven species were limited to the stream bottom and the river bottom—the more moist habitats within the Preserve. A total of eighteen species were limited to the two riparian woodland formations within the Preserve—the river bottom and the stream bottom communities. Of these eighteen species, seven are approaching their western limits of distribution (AOU, 1957). The Wood Duck, Prothonotary Warbler, Louisiana Waterthrush, Swainson's Warbler, and Cerulean Warbler are typical nesting species of the riparian habitats over their entire breeding ranges. The Ovenbird and the Worm-eating Warbler are typical woodland nesting forms over most of their range and are restricted to the riparian woodlands only in the

TABLE 9
UNDERSTORY PLANTS OF THE UPLAND FORESTS*

Species	Frequency of occurrence (per cent)
Mockernut hickory (*Carya tomentosa*)	29
Post oak (*Quercus stellata*)	20
Blackjack oak (*Quercus marilandica*)	14
Flowering dogwood (*Cornus florida*)	14
White oak (*Quercus alba*)	6
Shortleaf pine (*Pinus echinata*)	3
Common spicebush (*Lindera benzoin*)	2
Red oak (*Quercus rubra*)	2

* d.b.h. less than 4"; 1 m high.

southwestern limits of their nesting distribution (AOU, 1957). Four species were limited to the stream bottom and upland forests for their nesting activities within the Preserve. The intermediate character of the stream bottom communities was therefore emphasized by the nesting distribution pattern which showed an overlap of species from both the river bottom and the upland forests, as well as a mixed floral composition. The upland habitat was utilized by seven species exclusively for their nesting activities. Twenty-three species utilized all three of the major habitats in the Preserve for nesting activities. This pointed out the fact that a woodland habitat—regardless of its composition—was the only requirement for certain species with less specialized nesting niches. It was also noted that some of these species reached greater densities in one habitat than in the other.

Nine species were considered to be rare within the Preserve. The following reasons are suggested to explain the limited occurrence of these nine species: The Wood Duck and Prothonotary Warbler populations were limited due to the lack of proper nesting cavities in trees along the river; the minimal numbers of Red-shouldered Hawks are attributed to their large territorial requirements and the limited area of suitable river bottom habitat; the Roadrunner, having recently invaded this region (Lowery, 1955), is reaching its eastern limits of distribution (AOU, 1957); the Red-cockaded Woodpecker, being intimately associated with mature stands of pines, is limited by their distribution; the Brown-headed Nuthatch, Prothonotary Warbler, Swainson's Warbler, Worm-eating Warbler, and Cerulean Warbler are approaching the western limits of their nesting range (Griscom and Sprunt, 1957); and the Turkey populations, once extirpated from this area, have been reintroduced.

TABLE 10
NESTING BIRDS OF THE UPLAND FORESTS

Species	Pairs/100 acres 1961	Pairs/100 acres 1962	Average	Projected estimate (12,000 acres)
Turkey Vulture	+	+		+
Sparrow Hawk	1	1	1	20
Bobwhite		+		+
Turkey	+	+		+
Yellow-billed Cuckoo	6.6	6.6	6.6	792
Roadrunner	+	+		4
Screech Owl	+	+		+
Chuck-will's-widow		+		+
Chimney Swift	+	+		+
Yellow-shafted Flicker		+		+
Red-bellied Woodpecker	3.3	3.3	3.3	396
Red-headed Woodpecker	6.6	6.6	6.6	792
Hairy Woodpecker	3.3	+	3.3	396
Downy Woodpecker	+	3.3	3.3	396
Red-cockaded Woodpecker	+	+		7–10
Great Crested Flycatcher	6.6	6.6	6.6	792
Eastern Wood Pewee	9.9	9.9	9.9	1,188
Blue Jay	3.3	6.6	5.0	600
Common Crow	+	+		+
Carolina Chickadee	6.6	6.6	6.6	792
Tufted Titmouse	6.6	6.6	6.6	792
White-breasted Nuthatch	9.9	6.6	8.3	996
Brown-headed Nuthatch	+	+		+
Carolina Wren	3.3	6.6	5.0	600
Wood Thrush	+	6.6	6.6	792
Blue-gray Gnatcatcher	3.3	6.6	5.0	600
Red-eyed Vireo	9.9	19.9	14.5	1,740
Black-and-white Warbler	3.3	+	3.3	396
Parula Warbler	+	+		+
Yellow-throated Warbler	+	+		+
Pine Warbler	9.9	13.2	11.5	1,380
Prairie Warbler	+			+
Ovenbird	3.3	3.3	3.3	396
Scarlet Tanager	3.3	3.3	3.3	396
Summer Tanager	3.3	6.6	5.0	600
Indigo Bunting	3.3	+	3.3	396
Chipping Sparrow	+	+		+
Total (35 species, +2)	107	130	128	15,262

The densities of a few species within the Preserve were lower than those outside of the Preserve. Among these, personal observations indicated that the Chipping Sparrow, Bobwhite, Cardinal, Blue Jay, and Common Crow were more tolerant of the open areas created by the activities of man. Although common outside, the Mourning Dove, House Sparrow, Orchard Oriole, Brown-headed Cowbird, Eastern Bluebird, and Starling were found only in limited numbers in the small disturbed areas around the manager's home and barns. These species were never recorded in any other part of the Preserve. The population of ground nesting species was suppressed by the destruction of the ground cover, nests, and young by the activities of swine.

SUMMARY

Field studies of the nesting birds of the McCurtain Game Preserve, McCurtain County, Oklahoma, were conducted during the summers of 1961 and 1962 in the months of June, July, and early August. Intensive studies were made in three areas representative of the major habitats of the Preserve. Data derived from these study areas were augmented by less intensive surveys within each of the habitats at various locations over the Preserve.

The river bottom community supported the highest population of nesting birds (248 pairs per 100 acres) and the greatest number of species (36, plus six others possible). Eleven species utilized the river bottom habitat exclusively for nesting activities. The stream bottom community supported 136 pairs per 100 acres with 27 species (plus six others possible). The upland community supported 128 pairs per 100 acres with 35 species (plus two others possible). The total projected breeding bird population for the 13,300 acre virgin woodlands of the Preserve was 17,255 pairs composed of 56 species. Two of these species, the Red-cockaded Woodpecker and the Brown-headed Nuthatch are limited to the mature virgin pine areas of the Preserve in Oklahoma. The activities of swine suppress the population of ground nesting birds in the Preserve. The unique attributes of the virgin hardwood forest of the river bottom will be destroyed by waters of the Broken Bow Reservior now under construction. Steps should be taken to assure adequate protection for the remaining virgin woodland areas of the Preserve.

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